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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/027,683	12/21/2001	Edwin Charles Weldon	AM-6180	2033
32588	7590	06/25/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			MCDONALD, RODNEY GLENN	
			ART UNIT	PAPER NUMBER

1753

DATE MAILED: 06/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/027,683	Applicant(s) WELDON ET AL.	
	Examiner Rodney G. McDonald	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 April 2004.
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23, 26-34 and 37-43 is/are pending in the application.
 4a) Of the above claim(s) 1-21 is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 22, 23, 26-34 and 37-43 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

This application contains claims 1-21 drawn to an invention nonelected without traverse in the Paper of December 28, 2003. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 22, 23 and 26-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Donnell et al. (U.S. Pat. 6,620,520) in view of Singh (U.S. Pat. 5,558,789).

O'Donnell et al. teach **a component** resistant component **of semiconductor processing equipment** such as a plasma chamber. (See abstract)

In O'Donnell et al.'s invention **the component of the chamber is first surface prepared by cleaning and grit or bead blasting to provide a more chemically and physically active surface for bonding. (Compare to Applicant's component)** Prior to coating, the surface of the substrate is preferably thoroughly cleaned to remove surface material such as oxides or grease. Further, the surface can be roughened by known methods such as grit blasting prior to coating. By grit blasting, the surface area available for binding can be increased which can increase the coating bond strength. **The rough surface profile can also promote mechanical keying or interlocking of the coating with the substrate. (Compare to Applicant's required mechanical interlocks)** For aluminum reactor components, it is particularly desirable to roughen the component surface, **anodize the roughened component surface and again roughen the anodized surface prior to application of the zirconia toughened ceramic coating. (Compare to a ceramic surface with the mechanical interlocks)**
(Column 5 lines 1-16)

Aluminum oxide is formed by anodizing. (Column 5 lines 35-38) **(Compare to Applicant's required aluminum oxide)**

Components of the chamber **are typically made from metal or ceramic.**
(Column 7 lines 31-32)

One or more intermediate layers can be provided between the zirconia toughened ceramic coating and the surface of the component. (Column 7 lines 59-61)

As shown in Fig. 4 a first intermediate coating 80 is optionally coated on a reactor component 70 by a conventional technique. The first intermediate coating 80 can have a suitable thickness such as from 0.001 inches to 0.05 inches. (Column 7 lines 63-68; Column 8 lines 1-7) ***(Compare to Applicant's bond coat layer and required thickness)***

After depositing the optional first intermediate coating 80 onto the reactor component 70, the plating can be blasted or roughened, and then overcoated with the ***second optional coating 90 (Compare to Applicant's sacrificial top layer)*** or the zirconia toughened ceramic 100. ***A roughened layer 80 provides a particularly good bond. (Compare to Applicant's bond coat layer)*** Desirably, the second intermediate coating 90 imparts a high mechanical compression strength to the coating 80 and minimizes formation of fissures in the coating 90. (Column 8 lines 8-16)

The second intermediate coating 90 can have a thickness such as from 0.001 inches to 0.05 inches. (Column 8 lines 21-24) ***(Compare to Applicant's required sacrificial layer thickness)***

The first and second intermediate coating may be made of any one of more materials employed in conventional plasma processing chambers. Examples of such materials include metals, ceramics and polymers. Particularly desirable

metals include refractory metals. (Column 8 lines 27-31) **(Compare to Applicant's required layers being of metal including aluminum metal and refractory metals)**

It is contemplated that **the first and second intermediate layers 80 and 90, which are optional may be any one of the above-mentioned materials such that the coatings are the same or different depending on the desired properties.**

(Column 8 lines 42-45) **(Compare to Applicant's required different layers)**

The zirconia toughened ceramic components or coatings according to the present invention can decrease levels of **metal and particulate contamination**, lower costs by increasing the lifetime of consumables and reduce the levels of corrosion of chamber parts. (Column 9 lines 47-50) **(Compare to metal layer giving off material to be sacrificial)**

The differences between the present claims and the O'Donnell et al. is where the mechanical interlocks are undercut is not discussed, is where the sacrificial layer is aluminum is not discussed, is where the range of thickness of the sacrificial layer is not discussed, is where the bond coat layer has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic is not discussed, the range of thickness of the bond coat layer is not discussed and the method in which the mechanical interlocks are formed.

As to the mechanical interlocks being undercut the interlocking or keying feature is believed to suggest undercutting since to be keyed the layer must fit in a hole in the substrate like a "key" to a door in order to mate to make a strong bond. (Column 5 line 9)

As to the sacrificial layer being aluminum the layer 90 can be a metal. Metal covers aluminum as long as the aluminum layer imparts the desired properties.

(Column 8 lines 30 and 45)

As to the range of thicknesses of the sacrificial layer, it would be obvious to one of ordinary skill in the art at the time the invention was made to have selected a known thickness in the prior art's range which is within the range of applicant's claims because it has been held to be obvious to select a value in a known range by optimization for the best results, see *In re Aller*, et al., 105 U.S.P.Q. 233.

As to where the bond coat layer has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic O'Donnell et al. suggests utilizing refractory material for the bond coat layer which is what Applicant utilizes. (Column 8 lines 30-31)

As to the overlapping range of thicknesses of the bond coat layer when compared to the present claims, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by O'Donnell et al. because overlapping ranges have held to be a prima facie case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

The motivation for utilizing mechanical interlocks with undercuts is that it allows for increasing coating bond strength. (Column 5 lines 8-10)

The motivation for utilizing aluminum is that it allows for selecting a desired property of the component. (Column 8 line 45)

The motivation for utilizing a particular thickness for the sacrificial layer is that it allows for allowing it to be processed further. (Column 8 lines 19)

The motivation for utilizing a bond coat layer which has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic is that it allows for selecting a desired property of a component. (Column 8 line 45)

The motivation for utilizing a determined range of thickness of the bond coat layer is that it allows it to be processed further. (Column 7 line 68)

Singh teaches a method of producing an improved adherent interface between a film or coating and a substrate of metal, ceramic, or composite material by laser treatment of the surface. Semi-periodic microscale surface structures are made by laser irradiation. (See Abstract)

The motivation for laser treating is that it allows for production of an adherent interface. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified O'Donnell et al. by utilizing undercut mechanical interlocks, by utilizing a sacrificial layer of aluminum, by utilizing a determined range of thickness for the sacrificial layer, by utilizing a bond coat layer which has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic, and by utilizing a determined range of thickness of the bond coat layer as taught by O'Donnell et al. and by utilizing a laser machining technique to form mechanical interlocks as taught by

Singh because it allows for increasing coating bond strength, for selecting a desired property of the component, and for allowing it to be processed further and allows for providing an adherent interface between a coating and substrate.

Claims 33, 34 and 37-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Donnell et al. in view of Singh as applied to claims 22, 23 and 26-32 above, and further in view of Hong et al. (U.S. Pat. 5,897,752).

The difference not yet discussed is the plasma chamber being a sputter plasma chamber with the component being a deposition ring.

Hong et al. teach a plasma chamber which is a physical vapor deposition chamber which is also known as sputtering. (See Abstract) The clamp ring in Hong et al. can be formed of an insulating ceramic ring with a metallic film on its top surface. (See Column 6 lines 40-44)

The motivation for utilizing a clamp ring comprised of a ceramic and a metal is that it allows for controlling the sputtering characteristics of the plasma including the energy and directionality of the sputtered particles. (Column 6 lines 44-49)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized as the plasma chamber a sputtering chamber and to have utilized as the chamber component a deposition ring as taught by Hong et al. because it allows for controlling the sputtering characteristics of the plasma including the energy and directionality of the sputtered particles.

Response to Arguments

Applicant's arguments filed April 6, 2004 have been fully considered but they are not persuasive.

In response to the argument that Applicant's pattern etching processes are distinguishable over O'Donnell's grit blasting process as a method of roughening for layer adhesion on a component, it is argued that Applicant has only made a statement that "It is **expected** that silicon carbide grit blasting has a similar effect" i.e. produces microcracking leading to delamination. Applicant has not made a positive statement that grit blasting **will** cause microcracking and delamination of deposited layers thereon. This allegation is insufficient to distinguish Applicant's product claim from the product of O'Donnell et al. Applicant should provide evidence establishing the unobvious difference between the claimed product and the prior art product. Furthermore, O'Donnell et al. also suggest mechanical keying or interlocking of the coating, which as discussed in the rejection above suggests undercutting.

In response to the argument that the prior art does not suggest patterned formation of mechanical interlocks, it is argued that the blasting would produce a blasting pattern on the surface and therefore falls within the scope of "patterning".

In response to the argument that Singh's laser process is not the same as Applicant's laser process to produce the component product, it is argued that little weight is given to the method to produce the product and that O'Donnell et al. suggest the product with the mechanical interlocking or keying features. The undercut feature is discussed in the rejection of the claims above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
June 22, 2004